

**Chapter 4.10**

**Design Standards,  
Operation and Maintenance**

**of**

**On-site Wastewater  
Treatment Systems**

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## Chapter 4.10

### Design Standards for On-site Wastewater Treatment Systems

*The Lincoln/Lancaster County Health Department is assigned responsibility for administration of these design standards.*

#### Section 1. DEFINITIONS

**Apron** means a pad at least two feet square in area upon which the discharge pipe of a wastewater lagoon rests.

**Baffle** means a partition installed in a septic tank for proper operation of the tank and to provide maximum retention of solids, and includes sanitary tees.

**Bedrock** means a solid rock exposed at the surface of the earth or overlain by unconsolidated material.

**Bedroom** means any room within a dwelling that might reasonably be used as a sleeping room.

**Bentonite** means a high swelling clay derived from a chemically altered volcanic ash.

**Blackwater** means a waste carried off by toilets, urinals, and kitchen drains.

**Building drain** means that portion of the lowest horizontal piping of a drainage system which receives the wastewater discharge from within the walls of the building and conveys it to the building sewer beginning at least one foot outside the building footings.

**Building sewer** means that part of the drainage system extending from the end of the building drain to a treatment system or other approved point of disposal.

**Class 1 Foundations** means full basements, or non-basement footing foundations, and slab on grade for living quarters that are lower in elevation from the on-site wastewater treatment system.

**Class 2 Foundations** means non-basement footing foundations, trailer houses and slab on grade living quarters that are higher in elevation than the on-site wastewater treatment system.

**Class 3 Foundations** means structures using slab on grade construction not used as living quarters.

**Community water supply system** means a public water supply system which serves at least fifteen service connections used by year round residents or regularly serves twenty-five year round residents.

**Construction** means the installation of a new septic tank system or the replacement, alteration, or expansion of an existing system.

**Department** means the Lincoln-Lancaster County Health Department.

**Depth marker** means a device used to measure the liquid level present in a septic tank, wastewater lagoon, or other on-site wastewater treatment system.

**Development area** means an area of land in the State of Nebraska subdivided into lots where an on-site wastewater treatment system will be used.

**Distribution box** means a watertight box that receives the discharge of effluent from a septic tank and equalizes the flow to each individual line of a soil absorption system.

**Distribution system** means piping or other devices which distribute wastewater within a soil absorption system.

**Domestic wastewater** means human body waste and household type wastes including bath and toilet wastes, laundry wastes, kitchen wastes, and other similar wastes from dwellings and establishments, except animal wastes.

**Dosing chamber** means a receptacle for retaining wastewater until pumped or siphoned to the soil absorption system.

**Dosing device** means a pump, siphon, or other device that discharges septic tank effluent from the dosing chamber to the absorption areas.

**Dwelling** means any building, or portion thereof which is designed and used for residential purposes and which generates a wastewater flow equivalent to less than 10 bedrooms or 1000 gallons per day.

**Effluent** means wastewater flowing out of an on-site wastewater treatment system.

**Encroachment** means the intrusion on the required setback distances.

**Establishment** means a building, structure, house or place which generates wastewater flows greater than 1000 gallons/day, generates non-domestic wastewater, or serves as a restaurant, food preparation facility or food establishment.

**Failure** means an unauthorized discharge of effluent or wastewater on the surface of the ground; or to a cesspool, seepage pit, dry well, or leaching pit; or to an absorption system with less than 4 feet to groundwater or other limiting soil characteristics; or which threatens to cause pollution of any air, water, or land of the State; or which threatens public health.

**Fill** means soil, rock, gravel, or waste material which has been placed over the original soil or bedrock and is characterized by a lack of distinct horizons or color patterns as found in naturally developed, undisturbed soils.

**Filter material** means washed-gravel, crushed stone (except limestone), slag, clean gravel, or tire chips ranging in size from 1/4 to 2 1/2 inches. The filter media shall be free of clay, silt and rubber crumbs. Tire chips shall be 95% free of metal.

**Flood elevation - ten year** means that flood elevation which has a probability of being equaled or exceeded once in ten years.

**Flood plain** means the area adjoining a water course or drainage way which has been or may be covered by flood waters.

**100-year flood plain, flood prone area or special flood hazard area** means those lands which are subject to a one percent or greater chance of flooding in any given year.

**Food establishment** means an operation that stores, prepares, packages, serves, vends, or otherwise provides food for human consumption.

**Freeboard** means the distance between the liquid level and the top of the septic tank or the top of the lagoon dike.

**Gravelless system** means a chamber or pipe absorption system designed to be installed without filter material.

**Graywater** means all domestic waste excluding blackwater and including bath, lavatory, laundry, and sink waste except kitchen sink waste.

**Grease trap** means a watertight tank for the collection and retention of grease which is accessible for periodic removal of the contents.

**Ground water** means water occurring beneath the surface of the ground that fills available openings in rock or soil materials such that they may be considered saturated.

**Holding tank** means a tank for storage of wastewater until it can be transported to a point for proper disposal.

**Industrial waste** means wastewater not otherwise defined as domestic wastewater, including the runoff and leachate from areas that received pollutants associated with industrial or commercial storage, handling, or processing.

**Influent** means wastewater flowing into an on-site wastewater treatment system.

**Liner** means the material or substance used to line the bottom of a wastewater lagoon, sand filter, wetlands cell, or other on-site wastewater treatment system so that percolation of liquids through the soil is controlled.

**Lot** means a parcel of land occupied or intended for occupancy by a use permitted in Lincoln Municipal Code Title 27 - Zoning Code.

**Non-community water supply system** means any public water supply system that is not a community water system.

**Non-standard on-site wastewater treatment system** means a system which does not meet the requirements of these regulations or generates over 1000 gallons per day.

**NPDES** means a permit issued in accordance with the Nebraska Department of Environmental Quality Title 119 - Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System.

**Observation hole** means an excavation, test pit, or auger boring, used to determine the soil profile and conditions, or monitor the groundwater levels.

**On-site wastewater treatment system** means any system of piping, treatment devices, or other appurtenances that convey, store, treat, or dispose of wastewater on the property where it originates, or on nearby property under the control of the user, where the system is not connected to a wastewater works. All systems except septic systems are limited to a maximum size of 1000 gallons per day to be considered an on-site wastewater treatment system.

**Percolation rate** means the rate obtained from percolation tests used in determining the amount of absorption area required, usually expressed in minutes per inch

**Percolation test** means the determination of the suitability of an area for subsurface wastewater effluent disposal by testing the rate at which the undisturbed soil in an excavated pit or hole of standard size will absorb liquid per unit of surface area.

**Perforated pipe** means one type of distribution tile generally four inches in diameter with half to three-fourths inch diameter perforations designed to distribute wastewater effluent.

**Plastic limit** means the water content expressed as a percentage of the dry weight of soil at which the soil mass ceases to be plastic and becomes brittle.

**Pollution** means the man-made or man-induced alteration of the chemical, physical, biological, or radiological integrity of water, land, air, or vegetation.

**Private well** means a well which provides water supply to less than 15 service connections and regularly serves less than 25 individuals.

**Professional Engineer** means a person licensed by the State of Nebraska as a Professional Engineer.

**Public water supply system** means a water supply system designed to provide the public piped water fit for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals daily, at least sixty days out of the year. This definition shall include: a) any collection, treatment, storage, or distribution facilities under control of the operator of such system and used primarily in connection with such system, and b) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system.

**Sand** means a soil texture composed by weight of at least 85 percent of soil particles ranging in size between .05 and 2.0 mm or .002 inches and .08 inches.

**Sandy soil** means the soil having the following textures: sands, fine sands, loamy fine sands, and loamy very fine sands.

**Septage** means those solids and liquid removed during periodic cleaning of a septic tank.

**Septic tank** means a watertight covered receptacle designed and constructed to receive wastewater from a building sewer, separate solids from liquids, digest organic matter, store digested solids through a period of detention, and allow the clarified liquid to discharge to a soil absorption system.

**Sewage** means any water carrying domestic waste exclusive of footing and roof drainage, from any industrial, agricultural, or commercial establishment or any dwelling or any other structures.

**Site** means the area bounded by the dimensions required for the proper location of the soil absorption system.

**Slope** means the ratio of vertical rise or fall to horizontal distance.

**Sludge** means the accumulated settled solids deposited from wastewater and containing water to form a semi-liquid mass.

**Soil absorption system** means a drainfield, leaching area, or seepage bed including the effluent application/distribution system intended for the treatment of wastewater or disposal of effluent. The absorption system includes the infiltrative surface in the absorption trench and the soil between and around the trenches.

**Standard on-site wastewater treatment system** means a system which meets the requirements of Lincoln Municipal Code Chapter 24.38 and these design standards for on-site wastewater treatment systems.

**Surface waters** means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, springs, canal systems, drainage systems, and all other bodies or accumulations of water, natural or artificial, public or private, situated wholly or partly within or bordering upon the state. Impounded waters in this definition do not include areas designated by the Department as wastewater treatment or wastewater retention facilities or irrigation reuse pits.

**Wastewater** means the liquid and waterborne wastes derived from the ordinary living processes and of such character as to permit satisfactory disposal, without special treatment, into the public sewer or by means of an on-site wastewater treatment system.

**Wastewater lagoon** means a shallow body of water which meets the requirements of these design standards.

**Wastewater works** means facilities for collecting, transporting, pumping and treating wastewater and the disposal of treated effluent and sludges.

**Waters of the state** means all waters within the jurisdiction of this state, including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, water courses, waterways, wells, springs, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state.



## **Section 2. APPLICATION OF DESIGN STANDARDS**

- A. A dwelling or establishment that generates wastewater shall have an on-site wastewater treatment system in accordance with these design standards or be connected to a wastewater works.
- B. An on-site wastewater treatment system installed on or after the effective date of these design standards shall meet all requirements of the design standards.
- C. An on-site wastewater treatment system is subject to these design requirements if it is causing or contributing to a public health or safety hazard, a nuisance condition, failing, or conducting unauthorized discharges or being replaced or modified.
- D. Basic repairs not requiring a repair permit (LMC 24.38.040) and maintenance can be performed on an on-site wastewater treatment system that is functioning properly without upgrading to the requirements of these design standards.
- E. A temporary modification to a failing on-site wastewater treatment system not meeting the requirements of these design standards may be performed without meeting these standards if the modification is to prevent a surface discharge or reduce a threat to public health. The temporary modification may operate for no more than thirty (30) days without Department approval.
- F. A discharge of wastewater is prohibited:
  - 1. To surface water without a National Pollutant Discharge Elimination System (NPDES) permit;
  - 2. To groundwater without Department approval; and
  - 3. To the land surface from a dwelling, establishment, building sewer, or on-site wastewater treatment system without Department approval.
- G. In implementing these design standards, the Department shall protect the public's health, prevent nuisance conditions, prevent health and safety hazards, and protect the quality of surface and groundwater in the immediate vicinity of any proposed on-site wastewater treatment system. In protecting the quality of the ground and surface water, the Department shall consider the following:
  - 1. The use classification of the surface water and groundwater (NDEQ Title 117 - Nebraska Surface Water Quality Standards and Title 118 - Groundwater Quality Standards and Use Classification);
  - 2. Vulnerability of surface water and groundwater to pollution;
  - 3. The beneficial uses existing or assigned to the surface and groundwaters. Beneficial uses are those uses of surface and groundwaters as determined through NDEQ Title 117 and NDEQ Title 118, respectively;

4. Characteristics of the on-site wastewater treatment system;
  5. Technical and socioeconomic factors; and
  6. Other appropriate site-specific factors.
- H. In addition to the requirements of these design standards, all subsurface disposal systems serving more than 20 persons full time or discharging more than 2000 gallons per day, or on-site wastewater treatment system receiving non-domestic wastes may be subject to Nebraska Department of Environmental Quality (NDEQ) Title 122.
- I. Nothing in these design standards shall prevent more stringent local requirements from being adopted.
- J. Where applicable Nebraska Health & Human Services Title 178 NAC 12 - Regulations Governing Water Well Construction Pump Installation, and Water Well Decommissioning Standards and Title 179 NAC 2 - Regulations Governing Public Water Supply Systems may require more stringent setback requirements.

### **Section 3.     VARIANCE**

- A.     Any person who owns or is in control of any on-site wastewater treatment system or property on which an on-site wastewater treatment system exists or is proposed may apply to the Health Director for a variance from rules or design standards. The Director may grant such variance if he or she finds that:
1.     the proposed variance will not substantially reduce the capability or capacity of the on-site wastewater treatment system to treat sewage;
  2.     the discharges occurring or proposed to occur do not (or will not) endanger or tend to endanger human health or safety or create or contribute to pollution of air, land or water; and
  3.     compliance with the rules or design standards from which variance is sought would produce serious hardship without equal or greater benefits to the public. In making such findings the Health Director shall give due consideration to all facts and circumstances bearing upon the reasonableness of the discharges involved including but not limited to:
    - a.     The character and degree of injury to or interference with the health and physical property of the people;
    - b.     The risk, character and degree of environmental pollution; and
    - c.     The technical practicability and economic reasonableness of reducing or eliminating the emissions or discharges resulting from such source.
- B.     No variance shall be granted until the Health Director has considered the relative interests of the applicant, other owners of property likely to be affected by the discharges, and the general public.
- C.     Any variance or renewal thereof shall be granted within the requirements of subsection (A) of this section, for time periods and under conditions consistent with the reasons therefore, and within the following limitations:
1.     If the variance is granted on the grounds that there is no practicable means known or available for the adequate prevention, abatement, or control of the air, water, or land pollution involved, it shall be only until the necessary means for prevention, abatement, or control become known and available and subject to the taking of any substitute or alternate measures that the Health Director may prescribe;
  2.     If the variance is granted on the grounds that compliance with the particular requirements or requirements from which variance is sought will necessitate the taking of measures which, because of their extent or cost, must be spread over a considerable period of time, it shall be for a period not to exceed such reasonable time as, in the view of the Health Director, is requisite for the taking of the necessary measures. A variance granted on the grounds specified in this section shall contain a timetable for the taking of action in an expeditious manner and shall be conditioned on adherence to such timetable;

3. If the variance is granted on the ground that it is justified to relieve or prevent hardship of a kind other than that provided for in sub-division (1) or (2) of this subsection, it shall be for not more than one year.
- D. Any variance granted pursuant to this section may be renewed on terms and conditions and for periods which would be appropriate on initial granting of a variance. If a complaint is made to the Health Director on account of the variance, no renewal thereof shall be granted unless the Health Director finds that renewal is justified. No renewal shall be granted except on application therefore. Any such application shall be made at least thirty (30) days prior to the expiration of the variance. Immediately upon receipt of an application for renewal the Health Director shall give public notice of such application.
- E. A variance or renewal shall not be a right of the applicant or holder thereof but shall be in the discretion of the Health Director. The granting or denial of a variance or a renewal shall be by final order of the Health Director.
- F. Nothing in this section and no variance or renewal granted pursuant to this section shall be construed to prevent or limit the authority of the Health Director to cause abatement of public health nuisance conditions or take legal action.
- G. No variance shall be granted which will sanction any violation of state or federal statutes or regulations. All variance requests will be provided to NDEQ for their review and comment.

#### **Section 4. PERMIT APPLICATION AND SITE EVALUATION**

- A. Each proposed site for the location of an on-site wastewater treatment system shall be evaluated by the owner, his or her contractor, and the installer and the following information shall be recorded on application forms provided by the Department:
1. The type, size, location, and elevation of the proposed system, clearly identified on a scaled drawing of sufficient size which will include: the legal description and survey of the lot and immediate vicinity property lines, buildings, waters supply wells, buried water pipes and utility lines, the ordinary high water mark of lakes, rivers, streams, flood plain, reserve area and the location of the type of water supply wells within 1000 feet of the proposed on-site wastewater treatment system.
  2. An appropriate scaled drawing of the on-site wastewater treatment system which specifies location, materials of construction, capacity, setbacks and construction details.
  3. Depth to the highest measured or estimated water table and to the bedrock surface, if this depth is less than the depth of the water table.
  4. Direction of groundwater flow.
  5. Soil conditions, properties, and permeability.
  6. Additional information may be required.
- B. A new on-site wastewater treatment system shall not be installed in a designated ten-year floodplain or within the area of the ordinary high water mark of lakes, rivers, or streams.
- C. The seasonal high water elevation of the groundwater table must be at least four feet below the bottom of the soil absorption system in order to provide adequate filtration through the soil and avoid pollution of the groundwater. When available the following sources or types of information shall be used in determining the high water elevation of the groundwater.
1. U.S. Department of Agriculture Natural Resources Conservation Service soils maps and soil interpretation records.
  2. Evaluation of soil color and the presence or absence of mottling.
  3. Evaluation of impermeable or semi-permeable soil layers.
  4. Measured water levels for any nearby test hole(s), observation well(s), or water supply well(s).
- D. All dwellings and establishments constructed after the effective date of these design standards shall establish a reserve area to be used for a replacement on-site wastewater treatment system which will meet the requirements of these design standards:
1. The reserve area will be considered a part of the on-site wastewater treatment system and all setback requirements will apply.
  2. Soil percolation test or soil analysis must be performed for the reserve area and provided to the Health Director.

## Section 5. SETBACK DISTANCES

- A. The installation of a septic tank and soil absorption, infiltrative or evaporative system is prohibited within the setback distances in Table 5.1.

**Table 5.1 - Septic Tank and Soil Absorption Systems**

Item	Minimum Setback Distance in feet (meters)	
	Tanks	Absorption, Infiltrative, and Evaporative Systems
<b>Surface Water</b>	50 ft. (15.2 m)	50 ft. (15.2 m)
<b>Private Drinking Water Wells</b>	50 ft. (15.2 m)	100 ft. (30.5 m)
<b>Public Drinking Water Supply Wells:</b>		
Non Community System	50 ft. (15.2 m)	100 ft. (30.5 m)
Community System	500 ft. (152.4 m)	500 ft. (152.4 m)
Community System when a septic system or soil absorption system of > 1000 gpd is proposed	500 ft. (152.4 m)	Evaluated by professional engineer for potential impact on the well and submitted to the Department for approval if less than 1000 ft.
<b>All Other Water Wells:</b>	50 ft. (15.2 m)	100 ft. (30.5 m)
<b>Water Lines:</b>		
Pressure-Main	10 ft. (3.1 m)	25 ft. (7.6 m)
Pressure-Service Connection	10 ft. (3.1 m)	25 ft. (7.6 m)
Suction Lines	50 ft. (15.2 m)	100 ft (30.5 m)
<b>Property Lines</b>	15 ft (4.6 m)	15 ft. (4.6 m)
<b>Foundations:</b> (see "class" definition following Table 5.2)		
Except Neighbors Foundation:		
Class 1*	15 ft (4.6 m)	30 ft. (9.1 m)
Class 2**	10 ft. (3.1 m)	20 ft. (6.1 m)
Class 3***	7 ft. (2.1 m)	10 ft. (3.1 m)
Neighbors Foundation:		
Class 1*	25 ft. (7.6 m)	40 ft. (12.2 m)
Class 2**	20 ft. (6.1 m)	30 ft. (9.1 m)
Class 3***	15 ft. (4.6 m)	20 ft. (6.1 m)

- B. The installation of a lagoon is prohibited within the setback distances in Table 5.2

**Table 5.2 - Lagoons**

Item	Minimum Setback Distance - feet (meters)
<b>Surface Water:</b> Distance from High Water Mark	50 ft. ( 15.2 m )
<b>Private Drinking Water Wells:</b>	100 ft. ( 30.5 m )
<b>Public Drinking Water Supply Wells:</b>	
Non-Community	100 ft. ( 30.5 m )
Community	500 ft. (152.4 m )
<b>All Other Water Wells:</b>	100 ft. (152.4 m )
<b>Water Lines:</b>	
Pressure-Main	25 ft. ( 7.6 m )
Pressure-Service Connection	25 ft. ( 7.6 m )
Suction Line	100 ft. ( 30.5 m )
<b>Property Lines:</b>	50 ft. ( 15.2 m )
<b>Trees:</b>	50 ft. ( 15.2 m )
<b>Foundations:</b> (see "class" definition at end of Table 5.2)	
<b>Except Neighbors Foundation:</b>	
Class 1 *	100 ft. ( 30.5 m )
Class 2 **	100 ft. ( 30.5 m )
Class 3 ***	50 ft. ( 15.2 m )
<b>Neighbors Foundation:</b>	
Class 1 *	200 ft. ( 61.0 m )
Class 2 **	200 ft. ( 61.0 m )
Class 3 ***	100 ft. ( 30.5 m )

**\*Class 1 Foundations:**

Full basements, or non-basement footing foundations and slab on grade for living quarters that are lower in elevation from the on-site wastewater treatment system.

**\*\*Class 2 Foundations:**

Non-basement footing foundations, trailer houses and slab on grade living quarters that are higher in elevation than the on-site wastewater treatment system.

**\*\*\*Class 3 Foundations:**

Structures using slab on grade construction and are not used as living quarters.

- C. An on-site wastewater treatment system not located on the property owned by the person using the system shall have a permanent easement for use and maintenance of the system on the land on which the system resides.
- D. The Health Director may require greater setback distances for approvable discharge systems as necessary to protect the surface water.
- E. Setback distances for all other on-site wastewater treatment systems shall be determined by the Health Director and be established to protect public health and the environment.



## **Section 6. SOIL PERCOLATION**

- A. Soil percolation tests shall be conducted in the area where the soil absorption system will be located. Such tests shall not be made on disturbed ground or frozen ground. Where fissured or creviced formations are encountered below the ground surface, the Department shall be consulted for assistance.
- B. Percolation tests shall be performed as follows:
1. At least six (6) test holes shall be dug and spaced uniformly over the proposed absorption field site. If soil conditions are highly variable more tests will be required.
  2. Test holes shall be dug or bored with horizontal dimensions of four to twelve inches and vertical sides to the depth of the bottom of the proposed distribution trench. Holes can be cored with a posthole type auger.
  3. Roughen or scratch the bottom and sides of the bottom 12 inches of the holes to provide a natural surface. Remove all loose material from the hole. Place about two inches of 1/4 to 3/4 inch gravel in the hole to prevent bottom scouring.
  4. Fill the hole with clear water to a minimum depth of twelve inches over the gravel. By refilling, if necessary, or by supplying a surplus reservoir of water (automatic siphon), keep water in the hole for at least four hours, and preferably overnight. In sandy soils containing little or no clay, soaking is not necessary. If after filling the hole twice with 12 inches of water, the water seeps completely away in less than ten minutes, the test can proceed immediately. See subdivision 5(c) of this subsection.
  5. Percolation rate measurements should be made on the day following the saturation process, except in sandy soils.
    - a. If the water remains in the test hole after overnight saturation, adjust the water depth to a minimum of six inches over the gravel. From a fixed reference point, measure the drop in water level during a 30 minute period.
    - b. If no water remains in the hole after overnight saturation, add clear water to a depth of six inches over the gravel. From a fixed referenced point, measure the drop in water level at 30 minute intervals over a four hour period, refilling the hole to a depth of six inches over the gravel after each 30-minute period. The drop which occurs during the final 30-minute period must be used to calculate the percolation rate.
    - c. In sandy soils, or in other soils in which the first six inches of water seeps away in less than 30 minutes even after the overnight swelling period, the time interval between measurements can be taken as ten minutes, refilling the hole to a depth of 6 inches as necessary after each interval, six test measurements will be made at ten minute intervals. The drop that occurs during the final ten minutes must be used to calculate the percolation rate.

- d. Soils with moderately slow permeability and/or containing greater than 30% clay in the testing zone will require several days saturation when the soil is dry to achieve thorough swelling of the soil prior to making measurements.
  - 6. The percolation test data shall be recorded and maintained on the premises and submitted to the Department as required in Section 4.
  - 7. Other methods of determining the percolation rate may be approved by the Department if the method is recognized as providing accurate and consistent results.
- C. To obtain the percolation rate of a test hole (the average time in minutes for water to fall one inch), divide the number of minutes elapsed by the drop in inches. An average percolation rate for the entire field should be determined from the percolation rate of each of the test holes. If tests in the area vary more than 20 minutes/inch, variations in soil type are indicated. Under these circumstances, percolation rates shall not be averaged and the design shall be based on the slowest rate.
- D. Site Acceptability Based on Soil Conditions.
- 1. Soil is unsuitable for a soil absorption system if the percolation rate is faster than 5 minutes per inch, or is slower than 60 minutes per inch.
    - a. Soil with percolation rates faster than 5 minutes per inch are acceptable if a one foot thick loamy sand soil liner with a minimum percolation rate of 15 minutes per inch is installed in the bottom of the trench. A trench is then sized on this soil liner's percolation rate.
  - 2. A soil absorption system shall not be installed if the percolation rate is outside the range defined above unless designed by a professional engineer and a construction permit is issued by the Health Director.
  - 3. Any alternative non-standard on-site wastewater treatment system which is proposed to accommodate unsuitable soil conditions must be designed by a professional engineer and approved by the Health Director.
- E. The Health Director may require verification of percolation rates or perform percolation tests on the property when submitted results are inconsistent with other known data.

## **Section 7. SEPTIC TANK; CONSTRUCTION: MATERIALS USED**

- A. A septic tank shall be constructed of materials not subject to excessive corrosion or decay and shall be watertight. Concrete, concrete blocks, fiber reinforced plastic (FRP), high density plastic, and fiberglass are acceptable.
1. When precast and cast in place reinforced concrete tanks are used they shall be properly cured and of watertight construction.
  2. All concrete interior surfaces exposed to air shall be coated with a bitumastic or similar compound beginning at an elevation 3 inches below the normal operating level to minimize corrosion.
  3. Concrete block tanks shall be laid on a solid foundation and mortar joints shall be filled. The interior of the tank shall be surfaced with two one-fourth inch thick coats of portland cement, sand plaster, or shall be coated with a bitumastic material. Special attention shall be given to job-built tanks to insure water tightness.
  4. The tank shall be designed to withstand soil pressures when empty and not collapse or undergo excessive deflection which would prevent the proper operation of the system, crack or distort components of the system such as the baffles, prevent proper sealing of lids over manholes and inspection ports, or reduce the volume of the system.
  5. All septic tanks shall be permanently marked to specify the capacity in gallons, manufacturer, and the manufacturer's address. The gallon and manufacturing identification label shall be located next to the manhole towards the inlet side.

## **Section 8. SEPTIC TANK DESIGN**

- A. All septic tanks regardless of material or method of construction shall conform to the following criteria shown in figures 8.1, 8.2, 8.3, and 8.4.
1. The depth from the invert of the outlet to the floor of the tank (liquid depth) of any septic tank or compartment thereof shall not be less than 42 inches and a liquid depth greater than 78 inches shall not be considered in determining tank capacity. The diameter of a septic tank shall not be less than 60 inches and the length shall be approximately two to three times the width.
  2. No tank or compartment thereof shall have an inside horizontal dimension less than 24 inches.
  3. Inlet and outlet connections of the tank shall be provided with baffles. See Figure 8.5.
  4. The space in the tank between the liquid surface and the top of the inlet and outlet baffles shall be not less than 20 percent of the total required liquid capacity, except that in horizontal cylindrical tanks this space shall be not less than 15 percent of the total required liquid capacity.

5. Inlet and outlet baffles shall be constructed of acid resistant concrete, acid resistant fiberglass, or plastic.
6. Sanitary tees shall be affixed to the inlet or outlet pipes with a permanent waterproof adhesive. Baffles shall be integrally cast with the tank, affixed with a permanent waterproof adhesive, or affixed with stainless steel connectors top and bottom.
7. The inlet baffle shall extend at least 6 inches but not more than 20 percent of the total liquid depth below the liquid surface and at least one inch above the crown of the inlet sewer.
8. The outlet baffle and the baffles between compartments shall extend below the liquid surface a distance equal to 40 percent of the liquid depth except that the penetration of the indicated baffles or sanitary tees for horizontal cylindrical tanks shall be 35 percent of the total liquid depth. They also shall extend above the liquid surface as required in Section 8(A)(4). In no case shall they extend less than six inches above the liquid surface.
9. There shall be at least 1 inch between the underside of the top of the tank and the highest point of the inlet and outlet devices.
10. The inlet invert shall be not less than 2 inches above the outlet invert.
11. The inlet and outlet shall be located opposite each other along the axis of maximum dimension and shall be constructed of noncorrosive materials. The horizontal distance between the nearest points of the inlet and outlet devices shall be at least 4 feet.
12. Sanitary tees shall be at least 4 inches in diameter. Inlet baffles shall be located no less than 6 inches or no more than 12 inches measured from the end of the inlet pipe to the nearest point on the baffle. Outlet baffles shall be located 6 inches measured from beginning of the outlet pipe to the nearest point on the baffle.
13. Access to the septic tank shall be as follows:
  - a. There shall be one or more access manholes at least 12 inches in dimension. Each manhole shall have a cover.
  - b. There shall be an inspection pipe at least 6 inches diameter or a manhole over both the inlet and outlet devices.
14. Compartmentation of single tanks.
  - a. Septic tanks larger than 3000 gallons and fabricated as a single unit shall be divided into two or more compartments.
  - b. When a septic tank is divided into two compartments, not less than one-half nor more than two-thirds of the total volume shall be in the first compartment.
  - c. When a septic tank is divided into three or more compartments, one-half of the total volume shall be in the first compartment and the other half equally divided in the other compartments.
  - d. Connections between compartments shall be baffled so as to obtain effective retention of scum and sludge. The submergence of the inlet and outlet baffles of each compartment shall be as specified in Section (7) and (8).
  - e. Adequate venting shall be provided between compartments by baffles or by an opening of at least 50 square inches near the top of the compartment wall.

- 
- Diagram illustrating the cross-section of a rectangular settling tank. Key components and dimensions include:
- 6 INCH MINIMUM DIAMETER:** MUST BE CAPPED AT OR ABOVE SURFACE.
  - RISER > 12 INCHES IN DIAMETER** EXTEND WITHIN 6 INCHES OF SURFACE.
  - 5 TO 12 IN.** (Dimension for the riser section).
  - 12 INCH MINIMUM DIAMETER** (Dimension for the riser section).
  - 1 INCH MINIMUM** (Dimension for the top layer).
  - 1 INCH MINIMUM** (Dimension for the bottom layer).
  - 2 INCH MINIMUM** (Dimension for the bottom layer).
  - OUTLET** (Location of the outlet pipe).
  - 40% OF D MINIMUM** (Dimension for the outlet pipe).
  - D** (Overall depth of the tank).
  - SOLID LAYER** (Layer at the bottom of the tank).
  - LIQUID LAYER** (Layer above the solid layer).
  - SLUDGE LAYER** (Layer at the bottom of the tank).

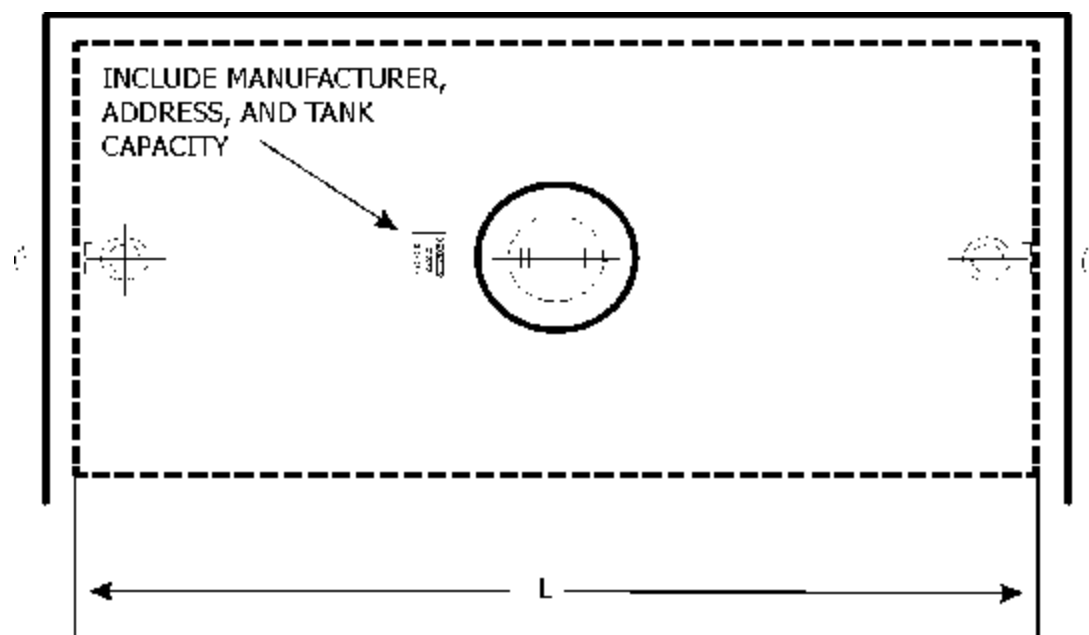


FIG 8.2 Septic Tank, Plan View

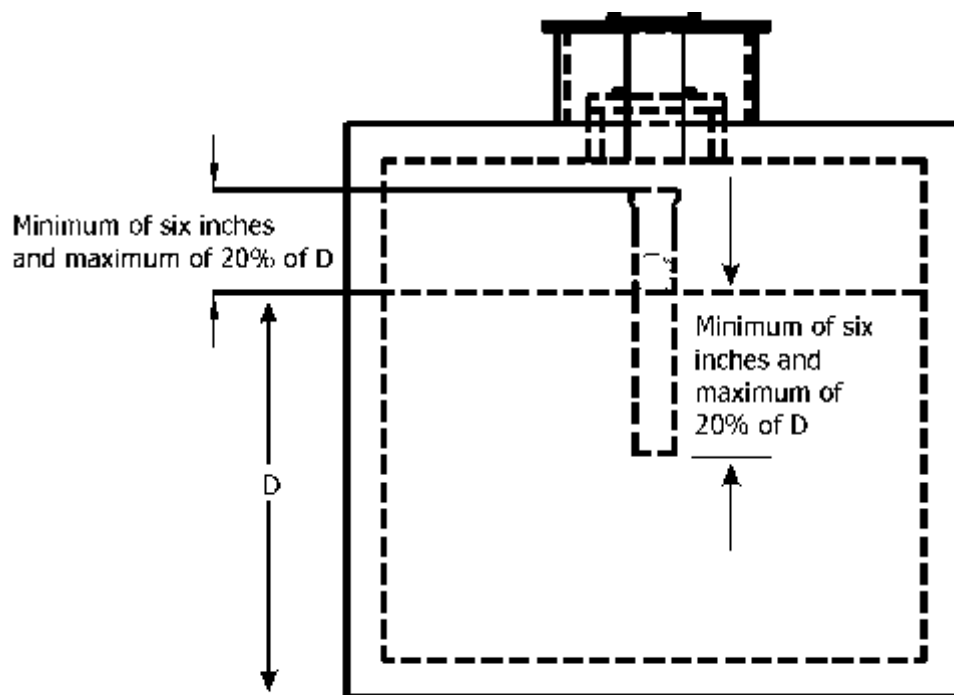
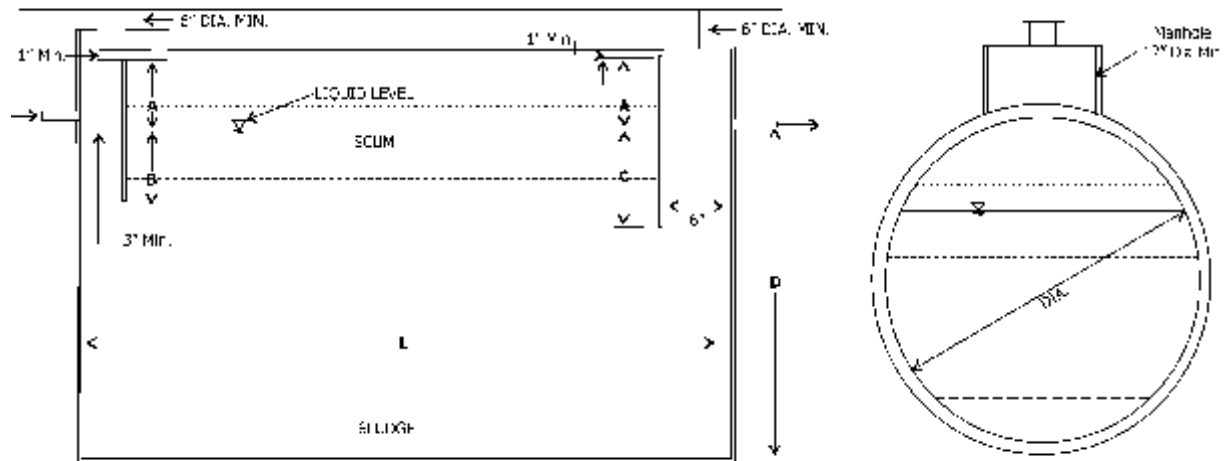


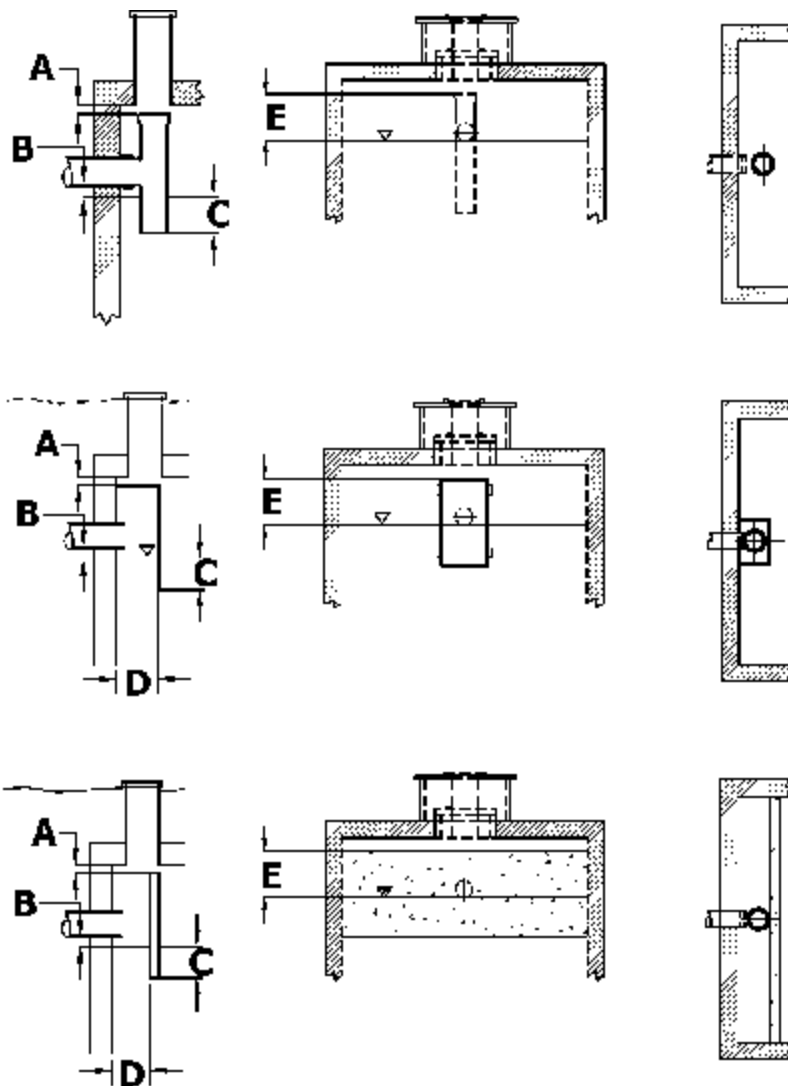
FIG 8.3 Septic Tank Inlet End View

## HORIZONTAL, CYLINDRICAL SEPTIC TANK



**FIG 8.4 Horizontal, Cylindrical Septic Tank**

DIMENSIONS			
A	0.15 Diameter	DIA	60 inch Minimum Inside Diameter
B	6 inch minimum 0.2 D Maximum	D	0.79 Diameter
C	0.35 D to nearest inch	L	2 to 3 times the diameter



**FIG 8.5 Baffles**

Baffle Notation	Measurement in Inches
A	\$1
B	Inlet \$2
C	Inlet \$6 but not more than 20% of tank depth Outlet \$6 but not more than 40% for square tanks and 35% for round tanks
D	Inlet \$6 but #12 Outlet = 6
E	\$6



## **Section 9. PLACEMENT OF SEPTIC TANK**

- A. The septic tank shall be bedded with at least six (6) inches of sand or fine gravel where rock or other undesirable conditions are encountered. The tank shall be placed level. Where excavation is required the hole shall be sufficiently large to permit placement of the tank. Backfilling the excavation for septic tanks shall be done in layers with sufficient tamping to avoid settling. Backfill material shall be free of large stones and debris.
- B. A tank located in a high water table or within the 100-year flood plain shall be properly secured or ballasted. The elevation of the flood plain cannot be higher than one foot below the top of the tank.
- C. The manhole shall extend to a point within 12 inches and no closer than 6 inches of finished grade. A riser larger than the manhole extending to the surface, to a point at, or at least within 6 inches of finished grade is also recommended. A cover shall be provided for the riser.
- D. The inspection pipe shall extend through the cover and be capped flush or above finished grade.

## **Section 10. SEPTIC TANK CAPACITY**

- A. “Dwellings” - The liquid capacity of a septic tank serving a dwelling shall be based on the number of bedrooms served. For three or less bedrooms, an adequate septic tank capacity shall be one thousand gallons. For each additional bedroom two hundred fifty gallons shall be added. Table 10.1 may be used to determine capacities.
  - 1. For ten or more bedrooms the septic tank shall be sized under the category of “Establishments.”
  - 2. For multiple dwellings connected to a single tank, one additional bedroom capacity must be added for each dwelling connected. Table 10.2 may be used for sizing.
- B. “Establishments” - The liquid capacity of a septic tank serving an establishment other than a dwelling shall be at least equal to 1125 gallons plus 0.75 times the design flow in gallons per day (gpd) for flows over 1500 gpd. For flows less than 1500 gpd, 1.5 times the design flow may be used but a minimum of a 1000 gallon tank is required.
- C. For design flows greater than 2000 gpd, the installation of a two-compartment septic tank or two septic tanks installed in a series is required.
- D. The tank capacity required for septic systems serving high strength, high temperature or inhibitors in wastewater such as food establishments, camper dump stations, laundry mats, and butcher shops or other similar facilities shall be doubled.

**Table 10.1 Septic Tank Sizing for a Single Dwelling**

<b>Number of Bedrooms One Dwelling</b>	<b>Design Flow in Gallons per Day</b>	<b>Septic Tank Size In Gallons</b>	<b>Dwelling with Whirlpool Bath, Septic Tank Size in Gallons</b>
1	200	1000	1000
2	300	1000	1000
3	400	1000	1250
4	500	1250	1500
5	600	1500	1750
6	700	1750	2000
7	800	2000	2250
8	900	2250	2500
9	1000	2500	2750
10	1100	Establishment	Establishment

**Table 10.2 Equivalent Septic Tank Sizing in Multiple Dwellings**

<b>Total Bedrooms</b>	<b>Single Family Dwelling</b>	<b>Two-Units</b>	<b>Three-Units</b>	<b>Four-Units</b>	<b>Five-Units</b>
1	1	-	-	-	-
2	2	3	-	-	-
3	3	4	5	-	-
4	4	5	6	7	-
5	5	6	7	8	9
6	6	7	8	9	Establishment
7	7	8	9	Establishment	Establishment
8	8	Establishment	Establishment	Establishment	Establishment
9	9	Establishment	Establishment	Establishment	Establishment

Add all of the bedrooms for the combined dwelling units and find that number in column 1. After finding the number of bedrooms in column 1 move to the column that has the number of units connected together and select the equivalent size. Use this number in Table 10.1 as the number of bedrooms to size the septic tank.

- E. For the purpose of this section, “capacity” shall be the volume as measured by the dimensions below the bottom of the outlet.

## **Section 11. HOLDING TANK**

- A. For dwellings, a holding tank shall have a minimum capacity of 1,000 gallons for two or fewer bedrooms plus 300 gallons for each additional bedroom.
- B. For establishments, a holding tank shall have a minimum capacity of at least five times the daily flow but never less than 1,000 gallons.
- C. Holding tanks shall be equipped with an alarm or visible float that indicates that tank is 90 percent full.

## **Section 12. GREASE TRAP**

- A. An external grease trap must be installed for all food establishments.
  - 1. Food establishments involved in food preparation that are replacing or modifying their on-site wastewater treatment system may install an additional septic tank in the waste line in lieu of a grease trap provided the following conditions are met:
    - a. The food establishment was constructed before the effective date of these design standards;
    - b. The current kitchen and blackwater waste streams are not separated;
    - c. The additional septic tank is sized following Section D below; and
    - d. The additional tank is placed in series with other tanks and complies with Section 8(A)(15).
- B. If an external grease trap is used it shall be constructed of materials and installed as prescribed in LMC 24.10 Lincoln Plumbing Code.
  - 1. Blackwater other than kitchen waste shall not be connected to a grease trap.
  - 2. All wastewater from the kitchen operation shall be connected to the external grease trap. The effluent from the grease trap shall connect to the inlet line of the septic tank.
- C. Operation and Maintenance
  - 1. Grease traps shall be operated properly and cleaned regularly to prevent the escape of appreciable quantities of grease.
  - 2. Solvents, enzymes, or other chemicals or physical agents which may liquify grease, including heat or hot water exceeding 180°F, shall not be used or applied.
- D. Sizing of Grease Traps
  - 1. A grease trap shall provide twenty-four hours of detention time for the average daily flow.
  - 2. The minimum capacity of any grease trap shall be 750 gallons.

### **Section 13. SOIL ABSORPTION SYSTEM**

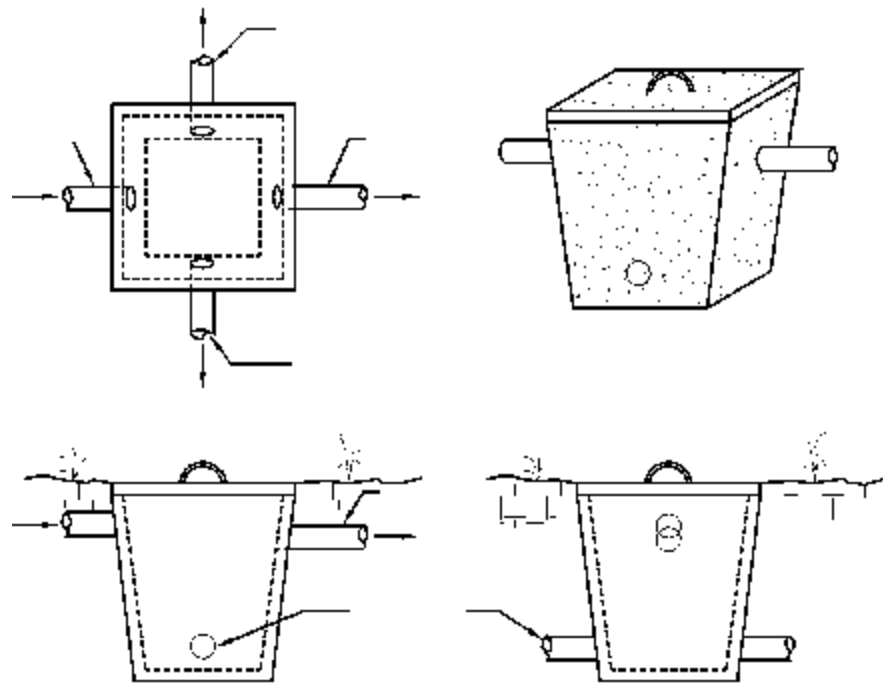
- A. A soil absorption system is the part of the on-site wastewater treatment system which utilizes the soil to further treat and dispose of effluent from an on-site wastewater treatment system in a manner that does not result in a point source discharge and does not create a nuisance, health hazards, or ground or surface water pollution.
- B. Two types of soil absorption systems are considered acceptable: absorption trenches and seepage beds.

### **Section 14. DESIGN AND CONSTRUCTION OF SOIL ABSORPTION SYSTEM**

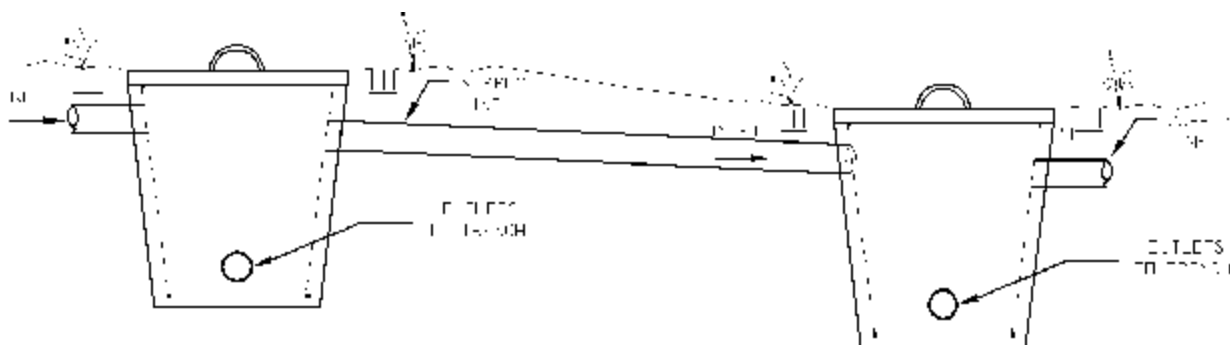
- A. The bottom of trenches and beds shall be at least four feet above the groundwater table. If a water table is not present then the bottom of the trench shall be at least four feet above the bedrock or other barrier layer.
- B. Trenches and beds shall not be more than 100 feet in length unless it is installed using an approved method or instrument to insure that the trench is level. If an approved method or instrument is used to assure the trench is level, then trenches can be up to 150 feet in length for gravity systems. Pressure systems are not restricted in length when an approved method or instrument is used to insure that the system is level.
- C. The bottom of the trench or bed excavation shall be level.
- D. The bottom and sides of the soil absorption system to the top of the filter material shall be excavated in such a manner as to leave the soil in a natural, unsmeared, and uncompacted condition. Excavation shall be made only when the soil moisture content is at or less than the plastic limit. The bottom and sides of the soil absorption system may be required to be roughened, scratched or otherwise modified to assure absorption.
- E. When the percolation rate is slower than 10 minutes per inch, excavation equipment or other vehicles shall not be driven on the soil absorption area.
- F. The distribution pipes shall be laid level or on a uniform slope away from the distribution device of no more than four inches per 100 feet.
- G. Distribution pipes in beds shall be uniformly spaced no more than 5 feet apart and not more than 30 inches from the side walls of the beds.
- H. The trenches or beds shall be backfilled and crowned above the finished grade to allow for settling. The top six inches of soil shall have the same texture and density as the adjacent soil.

- I. The minimum depth of cover over the distribution pipes shall be at least eight inches. The maximum depth of cover over the distribution pipes shall be no more than 36 inches.
- J. A grass cover shall be established by the owner over the soil treatment system.
- K. Gravity Distribution:
  - 1. When a soil absorption system is located in sloping ground from 0 to 3%, septic tank effluent may be distributed to the soil absorption system by either a distribution box, drop box or a header pipe.
  - 2. A soil absorption system in sloping ground with greater than 3% slope shall use a drop box or pressure distribution:
    - a. The bottom of each trench and its distribution line shall be level.
    - b. The absorption trenches shall follow the ground surface contours so that variations in trench depth are minimized.
    - c. There shall be a minimum of 6 feet of undisturbed earth between adjacent trenches and between the septic tanks and the nearest trench. When the slope exceeds 20%, there shall be a minimum of 10 feet of undisturbed earth between adjacent trenches and between the septic tanks and the nearest trench.
- L. Distribution box: Septic tank effluent may be distributed by a distribution box. The distribution box may be built as an integral part of the septic tank or may be a separate unit set on solid ground and anchored in the drainfield.
  - 1. The distribution box shall be set level and arranged so that effluent is evenly distributed to each distribution line.
  - 2. Each distribution line shall connect individually to the distribution box.
  - 3. The pipe connecting the distribution box to the distribution line shall be of a tight joint construction laid on undisturbed earth or properly bedded throughout its length.
  - 4. Distribution boxes shall be constructed of a durable, watertight, non-corrosive material. They shall be designed to accommodate the necessary distribution lines.
  - 5. Distribution boxes shall be provided with a minimum 12-inch diameter opening which will serve as a ready access for inspection, cleaning, and general maintenance.
  - 6. The inverts of all outlets shall be at the same elevation as measured from a liquid surface in the bottom of the box.
  - 7. The inlet invert shall be at least one inch above the outlet inverts.
  - 8. The outlet inverts shall be at least four inches above the distribution box floor.
  - 9. When septic tank effluent is delivered to the distribution box by pump, either a baffle wall shall be installed in the distribution box or the pump discharge shall be directed against a wall or side of the box on which there is no outlet. The baffle shall be secured to the box and shall extend one inch above the crown of the inlet flow line.

- M. Header pipe: If a header pipe is used the following criteria shall be observed:
1. Header pipe shall have a minimum diameter of 4 inches.
  2. When a header pipe is used, there shall be an equal number of distribution lines spaced evenly on both sides of the junction of the leader to the header.
  3. The header pipe shall be laid level with direct watertight connections to each drain field line and the septic tank outlet pipe. The header shall be encased in filter material.
- N. Drop box (see Figures 14.1 and 14.2): When drop boxes are used the following criteria shall be followed:
1. The drop box shall be watertight and constructed of durable materials not subject to excessive corrosion or decay.
  2. The invert of the inlet pipe shall be at least one inch higher than the invert of the outlet pipe to the next trench.
  3. The invert of the outlet pipe to the next trench shall be at least two inches higher than the invert of the outlet pipe of the trench in which the box is located.
  4. When septic tank effluent is delivered to the drop box by a pump, the pump discharge shall be directed against a wall or side of the box on which there is no outlet.
  5. The drop box shall have a removable cover either flush or above finished grade or covered by more than six inches of soil.



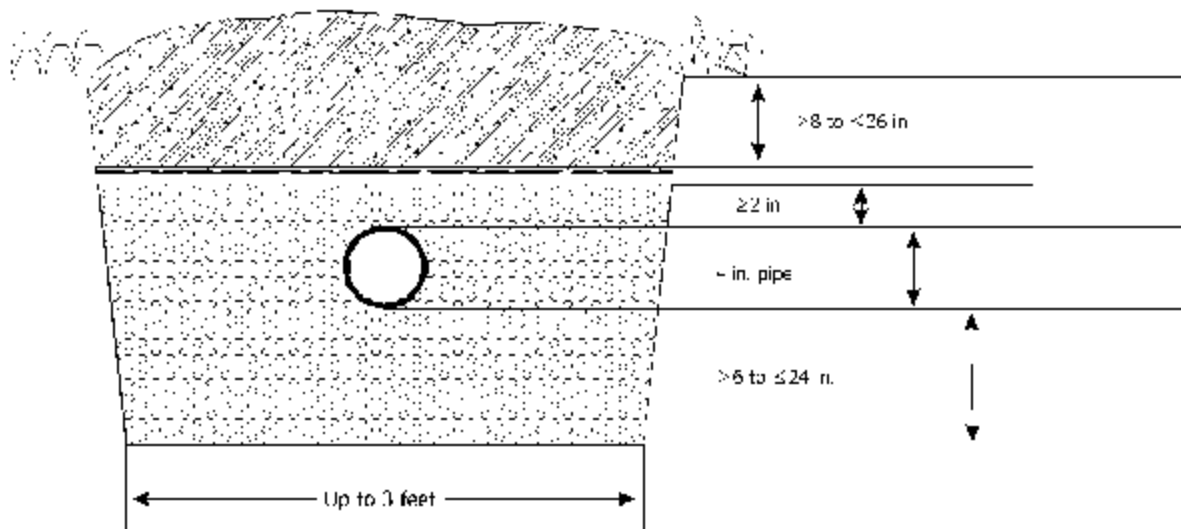
**FIG 14.1 Drop Box**



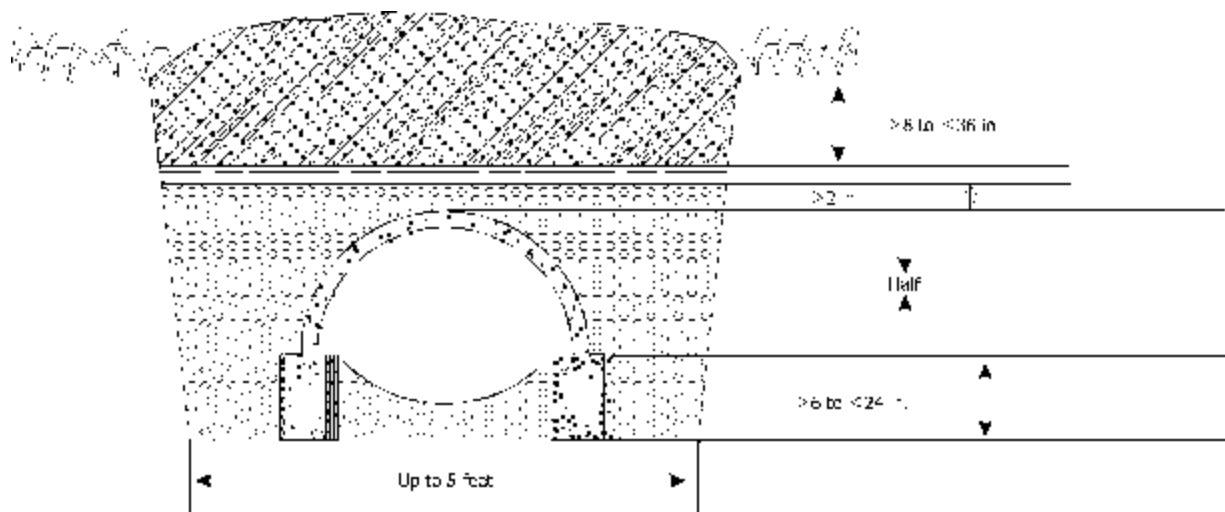
**FIG 14.2**  
**Drop Box On A Slope**  
**Profile View**

O. Filter Material Absorption Systems

1. The trenches shall not be less than 18 inches nor more than 36 inches wide for pipe laterals and not more than 5 feet wide for chambers. Any trench wider than 36 inches for pipes and 5 feet for chambers shall be considered a bed and have the absorption area reduced by the appropriate factor in Section Q(3). See Figures 14.3 and 14.4.
2. There shall be a layer of at least six but not more than 24 inches of filter material in the bottom of the trenches and beds. See Figures 14.3 and 14.4.
3. Distribution pipes, gravity distribution
  - a. Distribution pipes used in trenches or beds for gravity flow distribution shall be at least four inches in diameter and constructed of sound and durable material not subject to corrosion or decay or to loss of strength under continuously wet conditions. When open joint tile is used, the tile sections shall be spaced not less than 1/4 inch nor more than 1/2 inch apart.
  - b. Perforated pipe used for wastewater distribution pipes shall have one or more rows of holes of no less than one-half inch in diameter and not more than 3/4 inch in diameter spaced no more than 36 inches apart. Holes shall be spaced to prevent failure of pipe due to loads. Distribution pipes shall have a load bearing capacity of more than 1000 pounds per linear foot.
  - c. Half moon concrete or plastic tile may be used for wastewater distribution and shall be placed in trenches resting on concrete blocks suitably placed before filter material is added unless specifically designed to be self supporting on the gravel bed with an appropriate supporting foot. See Figure 14.4
4. The filter material shall completely encase the disposal pipes and chambers to a depth of at least two inches. See Figures 14.3 and 14.4.
5. The filter material shall be covered with untreated building paper or a two-inch layer of hay or straw or similar, approved permeable materials. See Figures 14.3 and 14.4.



**FIG 14.3**  
**Filter material with 4 inch pipe**



**FIG 14.1**  
**Filter material and chambers**



P. Non-Filter Material Absorption Systems

1. Gravelless pipes and chambers may be used for effluent treatment under the following conditions.
  - a. Pipes and chambers shall be of durable, non-degradable construction (Figures 14.5, 14.6, 14.7) specifically designed for installation without filter material.
  - b. Pipes and chambers shall be able to meet load requirements of 1000 pounds per linear foot.
2. Non filter material effective trench bottom area square footage.
  - a. Systems using pipe with filter fabric specifically designed for gravelless use shall use 75% of the outside perimeter of the pipe, up to a 12 inch diameter pipe, as the effective width of the trench. The use of pipe with a diameter of greater than 12 inches shall be considered a non-standard on-site wastewater treatment system and must be designed by a professional engineer.
  - b. Systems using chambers with at least six inches of slotted sidewall, specifically designed for gravelless use may use up to 1.5 times the bottom width of the chamber as the effective width of the trench. The effective width of the trench shall not exceed five feet for design purposes.

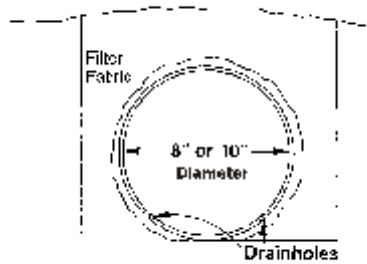


FIG 14.5  
Gravelless Pipe with Filter Fabric

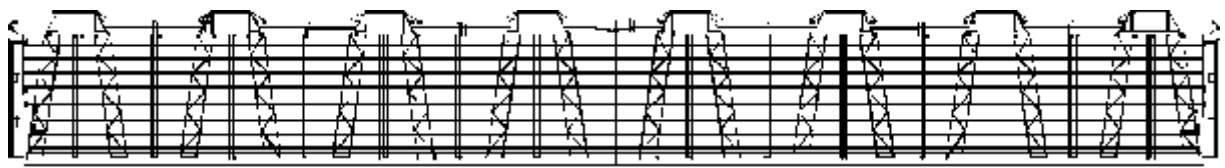


FIG 14.6  
Gravelless  
Chamber Profile  
View

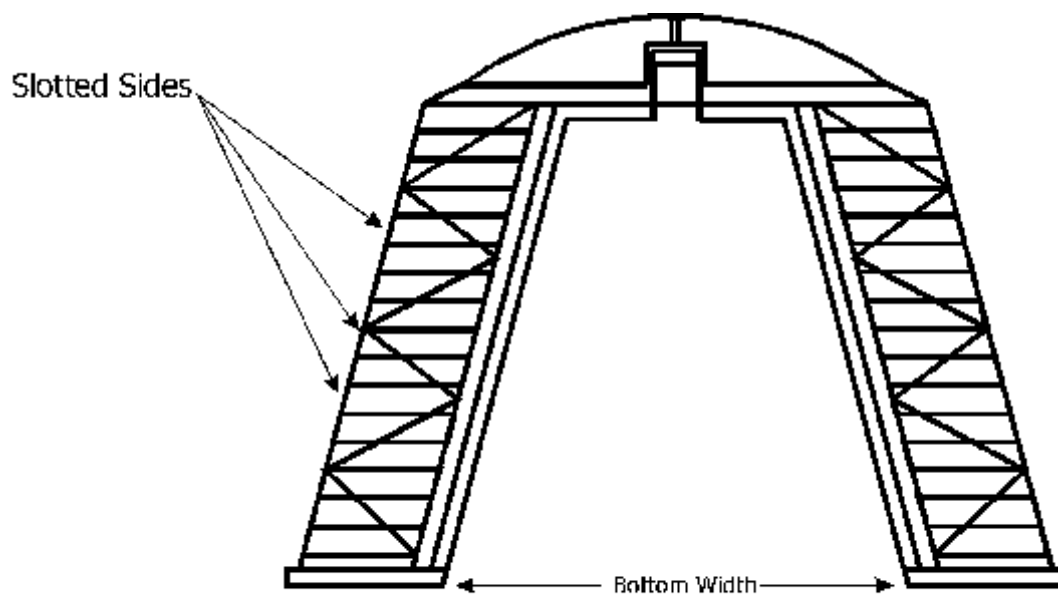


FIG 14.7  
Gravelless Chamber  
End View

Q. Absorption Trench Sizing:

1. The required square footage for absorption trenches for a dwelling shall be determined by Table 14.1 when a percolation test was performed.

**Table 14.1**

Perc Rate in minutes per inch	1 Bedroom 200 gpd	2 Bedroom 300 gpd	3 Bedroom 400 gpd	4 Bedroom 500 gpd	5 Bedroom 600 gpd	6 Bedroom 700 gpd	7 Bedroom 800 gpd	8 Bedroom 900 gpd	9 Bedroom 1000 gpd
<5	Systems must be designed with a 12 inch loamy sand liner that would have a percolation rate of 15 to 20 minutes per inch and shall be designed at the 11-20 minute per inch level								
5-10	165	330	495	660	825	990	1155	1320	1485
11-20	210	420	630	840	1050	1260	1470	1680	1890
21-30	250	500	750	1000	1250	1500	1750	2000	2250
31-40	275	550	825	1100	1375	1650	1925	2200	2475
41-50	330	660	990	1320	1650	1980	2310	2640	2970
51-60	350	700	1050	1400	1750	2100	2450	2800	3150
>60	Systems must be designed by a professional engineer. Construction Permit Needed.								

2. The required square footage for absorption trenches for establishments shall be determined by the following equation:  $\text{square footage} = \text{design flow (gpd)} \div (5 \div \text{percolation (min/in)})$ ; where design flow is in gallons per day and percolation rate is in minutes per inch.
3. Absorption area for a bed shall be calculated by determining the required square footage for a trench and multiplying the area by the factor from Table 14.2.

**Table 14.2**  
**Absorption Bed Multiplication Factor**

Width of Bed in feet	Factor
>3 to 10	1.25
>10 to 15	1.33
>15 to 20	1.50
>20	Unacceptable

R. Dosing.

1. Dosing is recommended for all systems and shall be provided when the design wastewater flow requires more than 500 linear feet of distribution line. When the design wastewater flow requires more than 1,000 linear feet of distribution line, the absorption field shall be divided into two equal portions and each half dosed alternately, not more than four times per day.

2. Dosing may be accomplished by either pumps or siphons. Each side of the system shall be dosed not more than four times per day. The volume of each dose shall be the greater of the daily wastewater volume divided by the daily dosing frequency, or an amount equal to approximately 3/4 of the internal volume of the distribution lines being dosed (approximately 0.5 gallons or 1.89 L per linear foot of 4-inch pipe.)

## **Section 15. MAINTENANCE OF SEPTIC SYSTEMS AND LAGOONS**

- A. The owner of any septic tank or his agent shall regularly inspect and arrange for the removal and sanitary disposal of septage from the tank whenever the top of the sludge layer is less than 12 inches below the bottom of the outlet baffles or whenever the bottom of the scum layer is less than three inches above the bottom of the outlet baffle.
- B. Disposal of septage shall be in accordance with Federal, State and local rules and regulations.
- C. The owner of a lagoon shall inspect, operate and maintain the lagoon in the following manner:
  1. The lagoon shall be maintained with a minimum of two feet of liquid depth. Care shall be taken to pump additional water to offset evaporation loss during hot weather.
  2. The lagoon area shall be mowed to keep grass and other plants at 6 inches or less in height on the lagoon slopes and top of dike.
  3. The lagoon shall be operated to prevent the liquid level from encroaching on the one foot freeboard requirement of the lagoon.
  4. Solids will be removed from the lagoon if needed and disposed of in accordance with federal, state and local regulations.
- D. To prevent soil erosion, all areas above the planned waterline and outside the lagoon which were disturbed during construction shall be seeded or sodded. Short grasses are preferred and shall be mowed to prevent overhanging vegetation. Alfalfa or similarly long rooted grasses which might damage the integrity of the of the lagoon shall not be used. No vegetation other than short grasses shall extend above the top of the dike within a fifty foot radius of the lagoon, including trees, weeds and brush.

## **Section 16. TYPE OF WASTE**

- A. The type of waste which can be directed to an on-site wastewater treatment system shall be limited to domestic wastewater. The following wastes are prohibited from entering an on-site wastewater treatment system unless specifically approved by the Health Director.
1. Cooling water, groundwater infiltration, discharge from roof drains, discharge from foundation tile drains, swimming pool water and wastewater, or other clear water discharges.
  2. Hazardous waste: Any chemical substance or material, gas, solid, or liquid designated as hazardous in accordance with NDEQ Title 128 even in quantities less than regulated amounts.
  3. Toxic substances: Toxic substances shall include antifreeze, oil, oil based or water based paint, gasoline, pesticides (insecticides and herbicides), solvents, brake fluid, transmission fluid, steering fluid, acids, and bases. Those pollutants or combination of pollutants or disease causing agents, which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will on the basis of information available to the Department cause either death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations on such organism or its offspring.

## **Section 17. ABANDONMENT OF SEPTIC TANK AND LAGOON SYSTEMS**

- A. Whenever the use of a septic tank system is discontinued following the connection to a sanitary sewer or following condemnation or demolition of a building or property or due to the construction of another on-site wastewater treatment system, the septic tank system shall be abandoned within 30 days and any further use of the system for any purpose shall be prohibited.
- B. Abandoned Septic Tanks:
1. Abandoned septic tanks shall be pumped of any existing liquids and solids and then filled with earth. The earth shall be tamped completely so as to prevent voids which would occur as the result of settling, or
  2. Abandoned septic tanks shall be removed after being pumped of existing liquids and solids.
- C. The abandonment of wastewater lagoons shall be done in the following procedure:
1. The lagoon shall be drained completely of any liquids.
  2. The settled solids at the bottom of the lagoon shall be scraped out and properly disposed. Including any liner material.
  3. The lagoon area shall be leveled and filled in with dirt. The dirt shall be mounded over the lagoon area to provide for future settling.

## **Section 18. LAGOONS - SITE LOCATION AND EVALUATION: DESIGN**

- A. A site for a lagoon shall permit the unobstructed wind to sweep across the lagoon to provide some mixing action and to add oxygen to the water. Timber must be removed for a distance of at least 50 feet from the outer dike toe of the lagoon.
- B. The lagoon shall be located and constructed so it will not receive surface runoff water.
- C. A lagoon shall not be installed or operated on a property less than three acres in size.
- D. The lagoon shall be designed for complete retention.
- E. The floor of the lagoon shall be located at least two feet above the highest expected groundwater level.
- F. The top of the dike shall be at least one foot above the 100 year flood plain elevation.
- G. The lagoon shall be located at least 2 feet above fractured bedrock.
- H. Testing of the final seepage rate shall be completed based on soil permeability. The maximum allowable seepage rate is 1/8 inch per day after sealing and compaction. This may be determined by an independent soils laboratory on a undisturbed soil sample taken at the site, or the two barrel method prior to filling, or a comparison test after prefilling with clean water but before introduction of wastewater or other methods approved by the Health Director.
  - 1. The two barrel method may be used for soil sealed lagoons before the lagoon is filled. Two similar 55 gallon drums are required, one a control drum with one end removed and the other drum (seepage drum) with both ends removed. One end of the seepage drum is pressed into the sealed soil layer, and a bead of polymer treated bentonite is packed around the inside edge of the drum. The seepage drum is carefully filled with water and kept filled for two or more days to saturate the soil. The test begins with filling each drum equally. Each day the difference in levels is recorded, and the barrels filled to the beginning level. The control drum measures the weather effects while the seepage drum records seepage plus weather effects. The test should continue for at least seven days.
  - 2. The comparison test method may also be used after the lagoon is prefilled. Isolate the lagoon and record the water level changes as a result of seepage and weather effects. The changes resulting from weather effects alone may be measured separately in a nearly full white plastic 5-gallon bucket partially buried near the shore. The test should continue for at least seven days.
- I. Lagoon sizing
  - 1. The size of lagoon shall be based on the location of the proposed system and the number of bedrooms and/or gallons per day contemplated in the dwelling or establishment served.
  - 2. Table 18.1 and 18.2 provide lagoon sizing requirements for square and round lagoons, respectively, for lagoons with a seepage rate of 1/8" per day. If the seepage rate is less than 1/8" per day, the required lagoon size shall be determined by the equation in Section 18(Q).

**TABLE 18.1**  
**Square Lagoon Side In Feet**  
**For Seepage Rate of 1/8" Per Day**

No. of Bedrooms	Flow	5' Level	6' (Top) Level	Bottom
1	150 gpd	37'	43'	7'
2	225 gpd	46'	52'	16'
3	300 gpd	53'	59'	23'
4	375 gpd	59'	65'	29'
5	450 gpd	64'	70'	34'
6	525 gpd	70'	76'	40'
7	600 gpd	74'	80'	44'
8	675 gpd	79'	85'	49'
9	750 gpd	83'	89'	53'
10	825 gpd	87'	93'	57'
11	900 gpd	91'	97'	61'
12	975 gpd	95'	101'	65'
13	1050 gpd	System must be designed by a professional engineer. A permit from NDEQ is also required.		

**TABLE 18.2**  
**Round Lagoon Diameter In Feet**  
**For Seepage Rate of 1/8" Per Day**

No. of Bedrooms	Flow	5' Level	6' (Top) Level	Bottom
1	150 gpd	42'	48'	12'
2	225 gpd	52'	58'	22'
3	300 gpd	60'	66'	30'
4	375 gpd	67'	73'	37'
5	450 gpd	72'	78'	42'
6	525 gpd	79'	85'	49'
7	600 gpd	83'	89'	53'
8	675 gpd	89'	95'	59'
9	750 gpd	94'	100'	64'
10	825 gpd	98'	104'	68'
11	900 gpd	103'	109'	73'
12	975 gpd	107'	113'	77'
13	1050 gpd	System must be designed by a professional engineer. A permit from NDEQ is also required.		

- J. Dike and floor construction
1. The floor of the lagoon shall be level. A difference of plus (+) or minus (-) three inches is permitted. All vegetation shall be removed from the floor of the lagoon. This organic material shall not be used in the construction of the lagoon.
  2. The soil material of the lagoon floor shall be designed so that it shall not seep more than 1/8th inch per day. If soil borings and tests indicate that the existing soils are not conducive to compaction, then one of the following means of restricting seepage shall be used
    - a. Soda ash;
    - b. Bentonite; or
    - c. A synthetic liner.
- K. The slope of the dikes shall not be steeper than three horizontal to one vertical. The minimum width of the top of the dike shall be 4 feet.
- L. The minimum operating depth of the lagoon shall be two feet. The maximum operating depth shall be 5 feet. The dikes shall provide a minimum freeboard of 12 inches.
- M. The lagoon shall be equipped with a depth marker.
- N. The lagoon shall be fenced with at least a four foot high woven wire or welded wire fence with the first strand starting three inches from the ground and the following strands spaced evenly. The fence shall be equipped with a standard main gate that is kept locked. The fence shall be placed on the outside edge of the top of the dike or four feet outside the toe of the dike. Signs shall be located on each gate with a warning of "NO TRESPASSING - WASTEWATER LAGOON."
- O. Influent line or distribution pipe
1. The influent line shall be at least four inches inside diameter and shall have a grade of not less than 1/8 inch per foot.
  2. The line shall be equipped with clean-outs with tight fitting caps, at every seventy-five feet or less, or where angles greater than forty-five degrees are encountered. A clean out shall be located at least one foot above the highest water level and near the outside of the dike embankment.
  3. The line shall be center discharging and shall discharge on a concrete apron at least 2 feet square.
  4. The pipe shall have a loading capacity of not less than 1,000 (455 kg) pounds per square foot. Plastic pipe shall be installed and supported in such a manner that there is no deflection during backfilling or compaction.
- P. The lagoon shall be filled with surface or groundwater to a depth of two feet before wastewater wastes are discharged into it.



Q. Sizing formula

***Lancaster County Equation***

$$A = \frac{I \times 967}{29.72 + (SEEP \times 608)}$$

***General Equation***

$$A = (I \div 7.48 \times 365 \times 20) \div [(((EVAP - PRECP) \div 12) \times 20) + LV + ((SEEP \div 12) \times 365 \times 20)]$$

***Simplified Equation:***

$$A = \frac{I \times 967}{((EVAP - PRECP \times 1.67) + LV + (SEEP \times 608))}$$

- A* = Area (surface area at maximum operating depth) in square feet  
*I* = Inflow in gallons per day  
*EVAP* = Net evaporation from Figure 18.3 in inches per year  
*PRECP* = Net precipitation from Figure 18.4 in inches per year  
*LV* = Lagoon depth between maximum and minimum operating depths (normally three feet)  
*SEEP* = Seepage rate through lagoon liner in inches per day; 1/8 inch or less allowable  
*7.48* = Conversion of gallons per day to cubic feet per day  
*365* = Conversion from days to one year  
*12* = Conversion from inches to feet  
*20* = 20 year design life

1. Take the square root of the area to get the length of a side (in feet) at the high operating level for a square lagoon (Figure 18.1, 18.2)

*Length of a side in feet = √A*

2. Flow for dwellings shall be estimated at a minimum of 150 gpd + ((Number of Bedrooms - 1) x 75 gpd).

